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ARMORSTART[®] DISTRIBUTED MOTOR CONTROLLER Getting Started

BULLETIN 284D



Introduction

This guide provides the basic information required to start up your ArmorStart[®] Distributed Motor Controller. Factory default settings and information regarding installing, programming, and DeviceNet[™] Node Commissioning are described here. For detailed information on specific product features or configurations, refer to the ArmorStart user manual, Publication 284-UM001*-EN-P.

This guide is intended for qualified service personnel responsible for setting up and servicing these devices. You must have previous experience with and a basic understanding of electrical terminology, configuration procedures, required equipment, and safety precautions. You should understand DeviceNet network operations, including how slave devices operate on a network and communicate with a DeviceNet master. You should also be familiar with RSNetWorx[™] for DeviceNet. **You must use RSNetWorx for DeviceNet revision 3.21 service pack 2 or later.** This software package is referred to often in this manual. Rockwell Automation product EDS files are available on the internet at: <http://www.ab.com/networks/eds>.



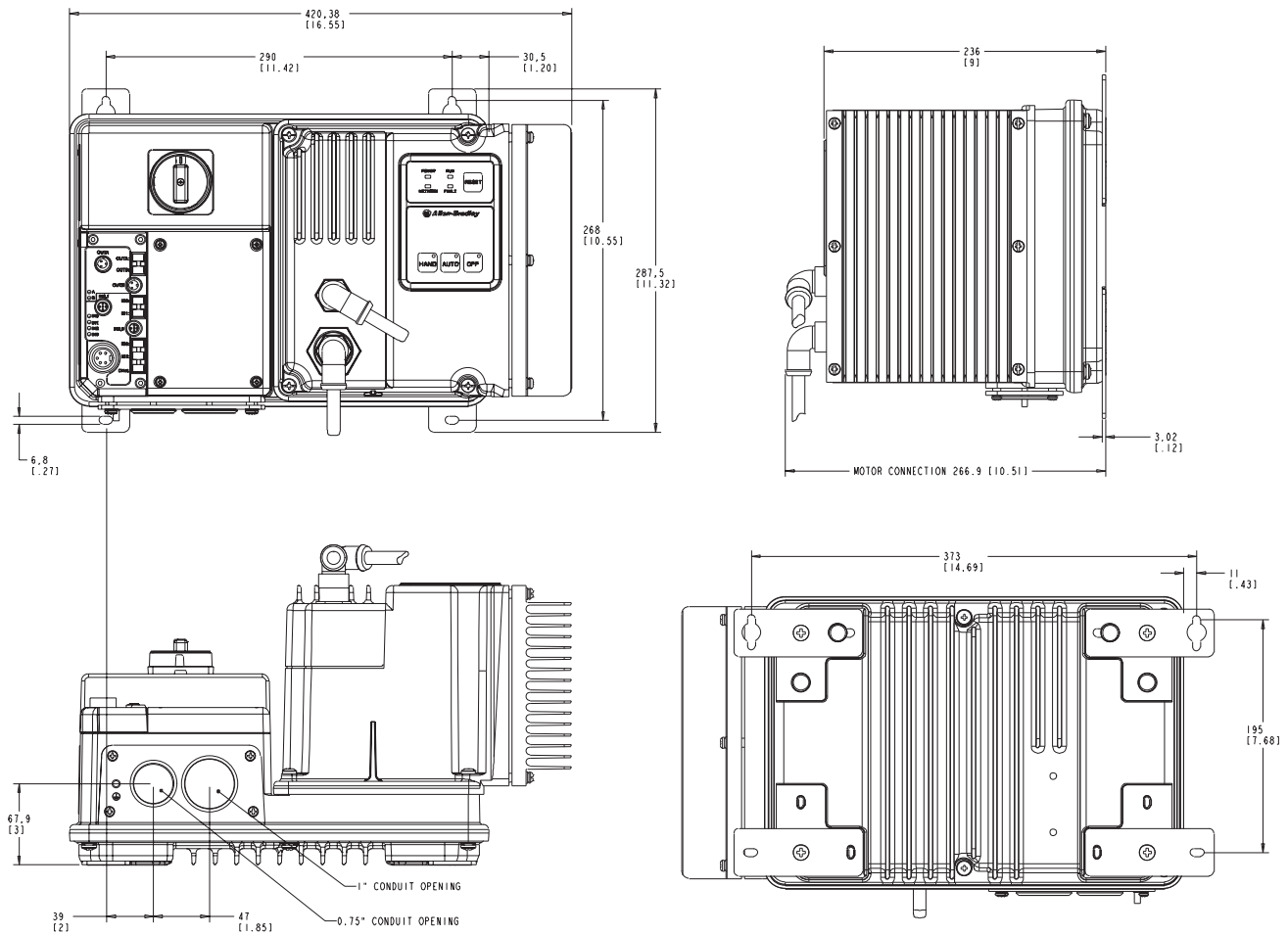
Installation

The ArmorStart Distributed Motor Controller is convection cooled. Operating temperature must be kept between $-20...40^{\circ}\text{C}$ ($-4...104^{\circ}\text{F}$).

Dimensions

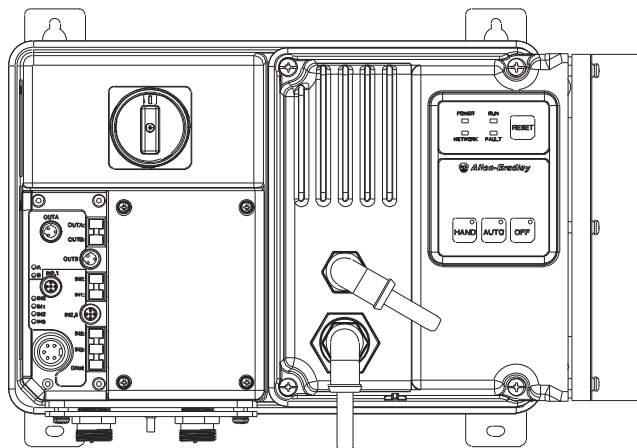
Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Figure 1 Dimensions for 1 Hp and below @ 230V AC, 2 Hp and below @ 460V AC, and 2 Hp and below @ 575V AC, IP67/NEMA Type 4 with Conduit Entrance

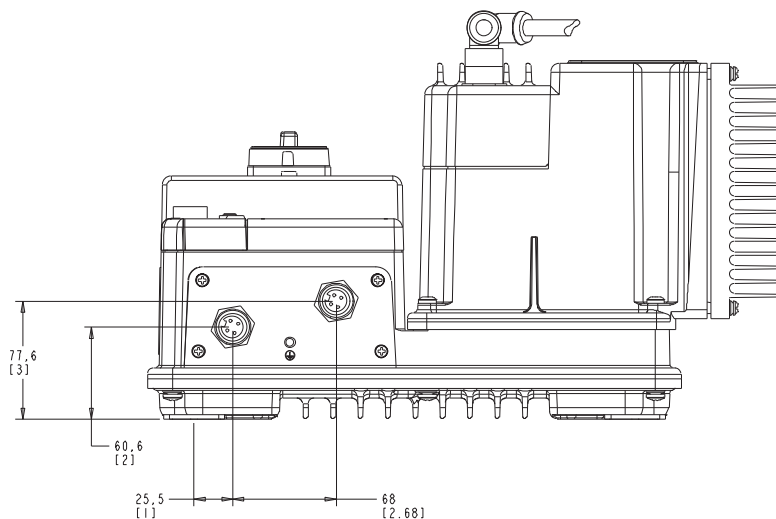


Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Figure 2 Dimensions for 1 Hp and below @ 230V AC, 2 Hp and below @ 460V AC, and 2 Hp and below @ 575V AC, IP67/NEMA Type 4 with ArmorConnect™ Connectivity



ArmorStart device with a 10 A short circuit protection rating



Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Figure 3 Dimensions for 2 Hp @ 230V AC, 3 Hp and above @ 460V AC, and 3 Hp and above @ 575V AC, IP67/NEMA Type 4 with Conduit Entrance

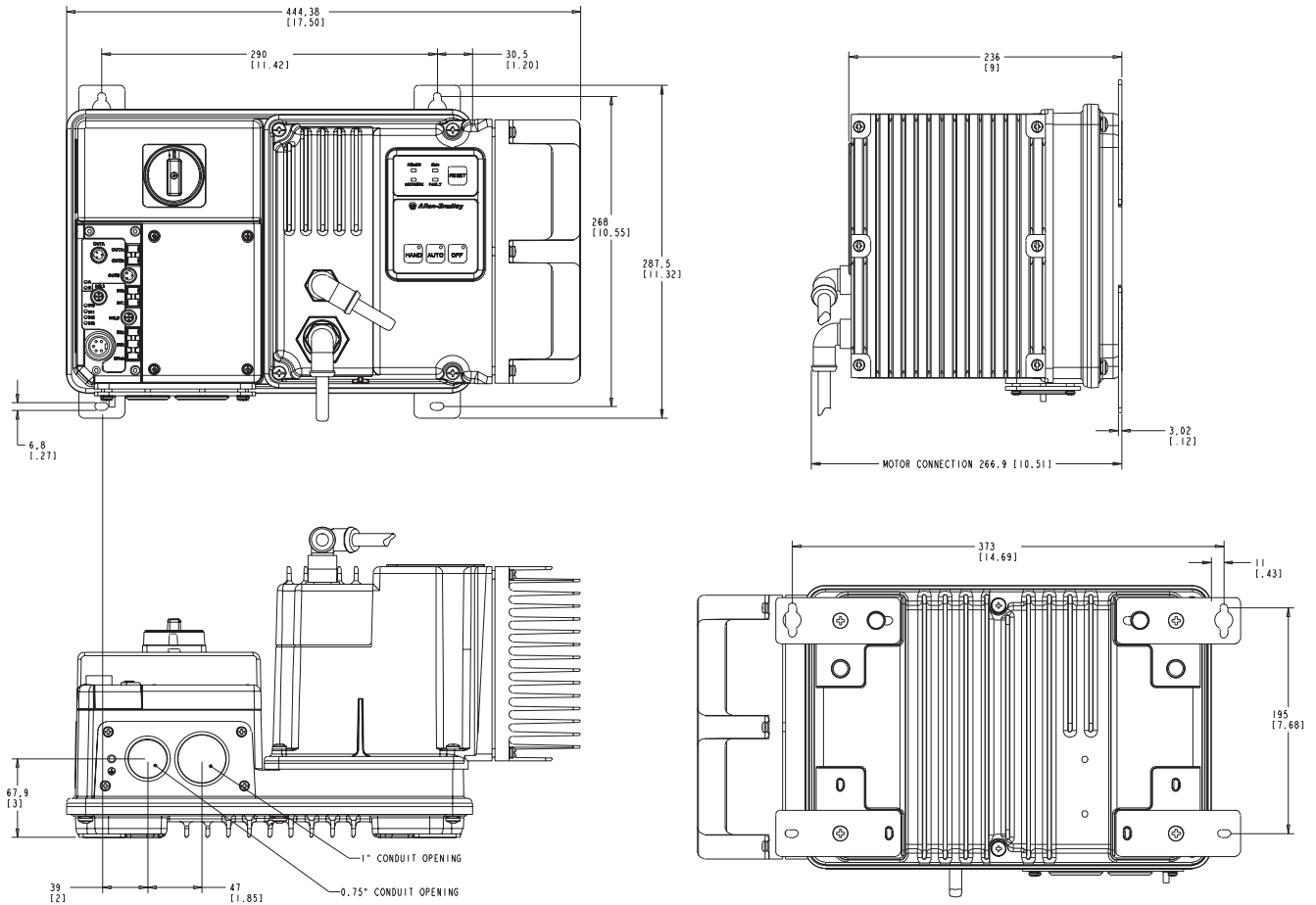
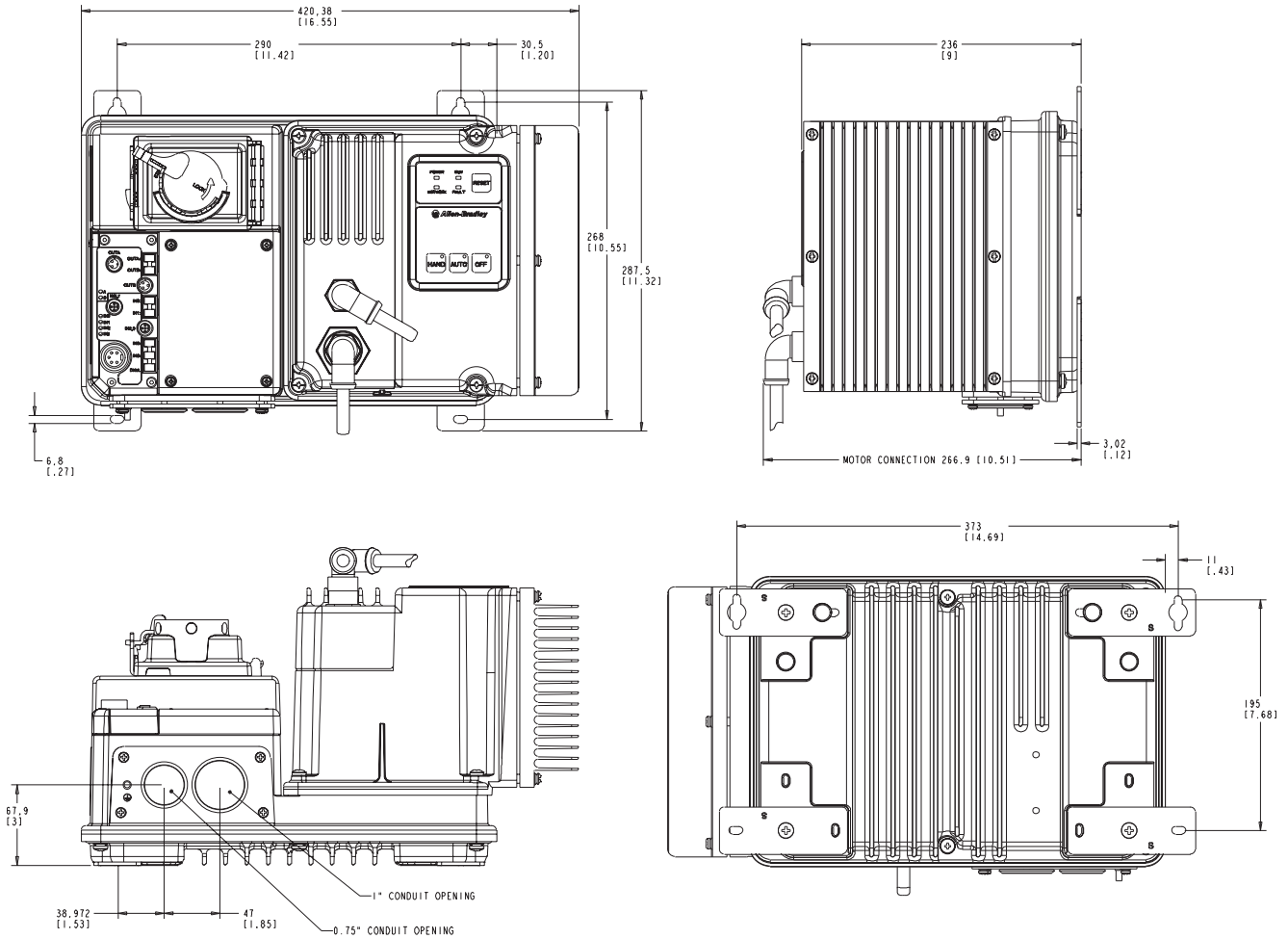


Figure 4 Dimensions for 2 Hp @ 230V AC, 3 Hp and above @ 460V AC, and 3 Hp and above @ 575V AC, IP67/NEMA Type 4 with ArmorConnect Connectivity



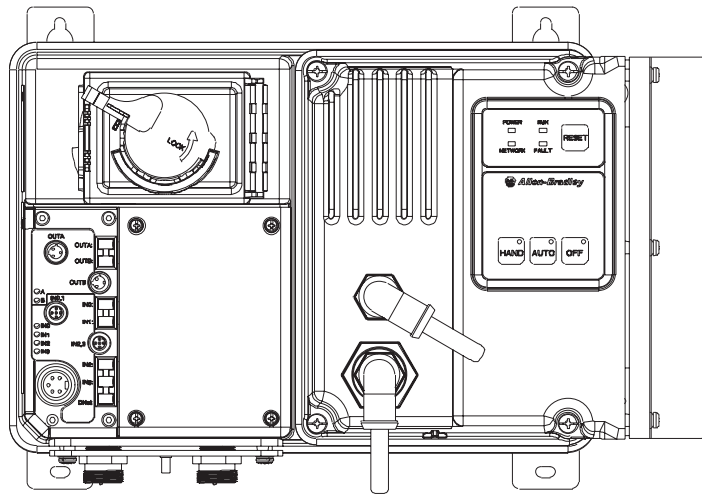
Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Figure 5 Dimensions for 1 Hp and below @ 230V AC, 2 Hp and below @ 460V AC, and 2 Hp and below @ 575V AC, NEMA Type 4X with Conduit Entrance

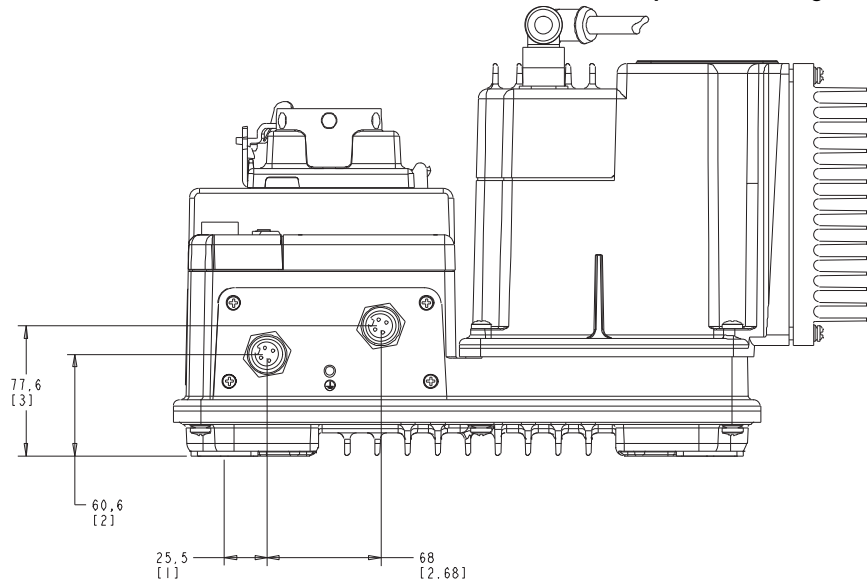


Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Figure 6 Dimensions for 1 Hp and below @ 230V AC, 2 Hp and below @ 460V AC, and 2 Hp and below @ 575V AC, NEMA Type 4X with ArmorConnect™ Connectivity

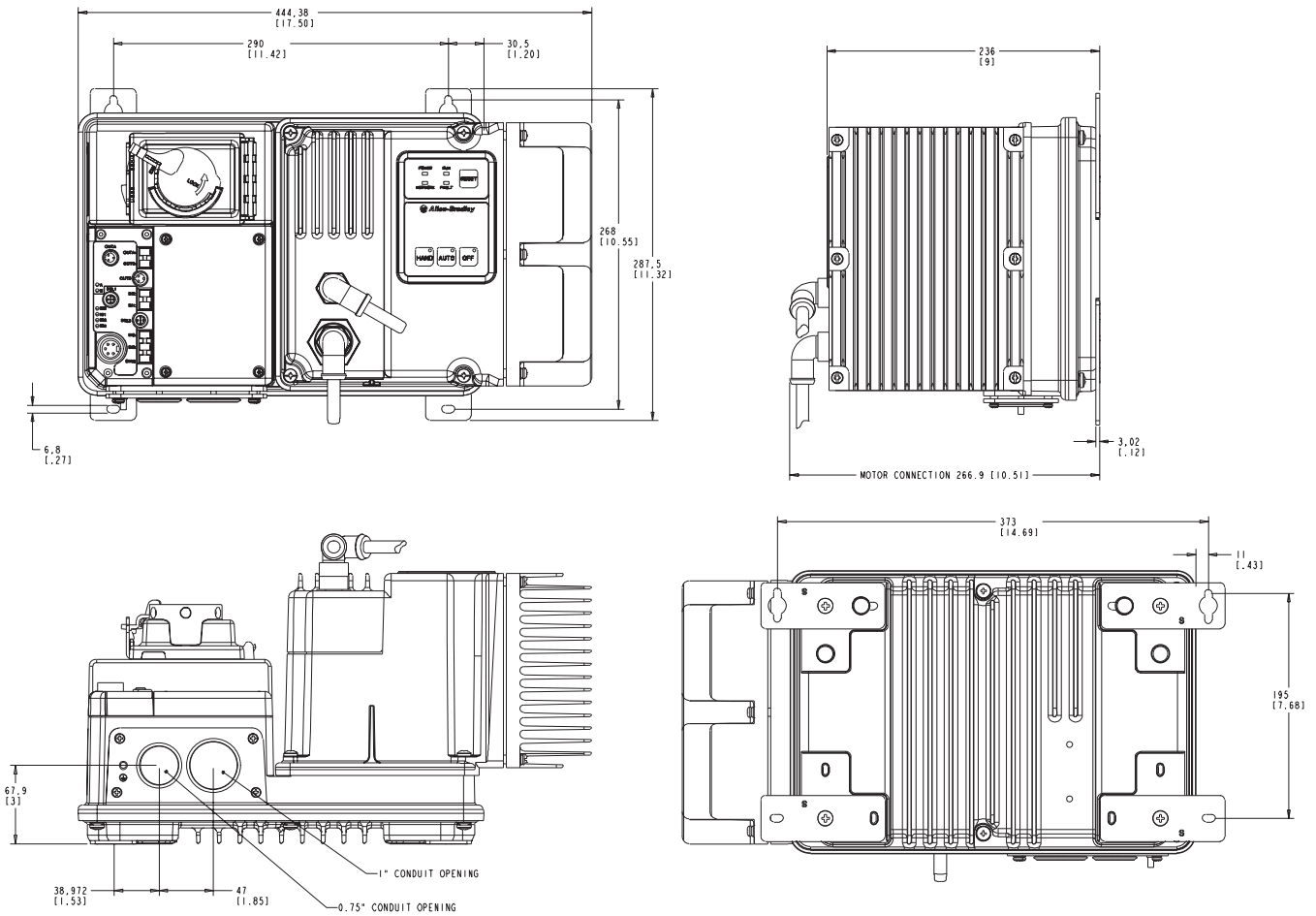


ArmorStart device with a 10 A short circuit protection rating



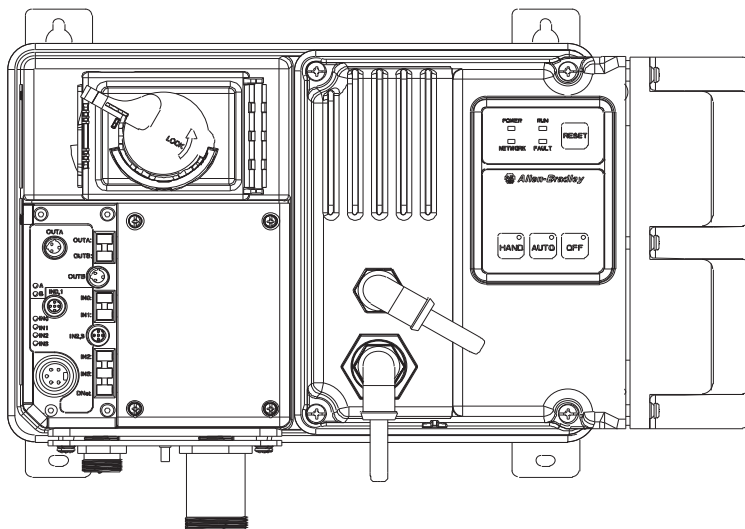
Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Figure 7 Dimensions for 2 Hp @ 230V AC, 3 Hp and above @ 460V AC, and 3 Hp and above @ 575V AC, NEMA Type 4X with Conduit Entrance

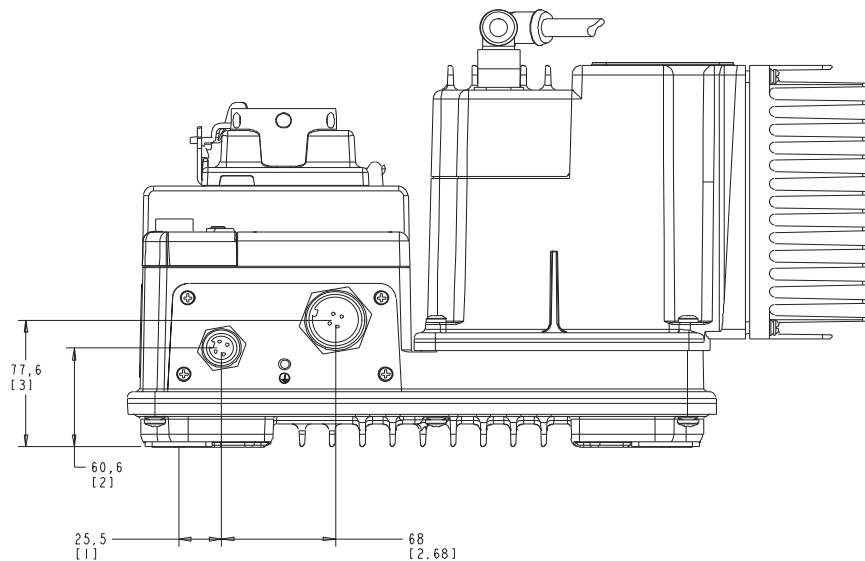


Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Figure 8 Dimensions for 2 Hp @ 230V AC, 3 Hp and above @ 460V AC, and 3 Hp and above @ 575V AC, NEMA Type 4X with ArmorConnect Connectivity



ArmorStart device with a 25 A short circuit protection rating



Wiring

Power, Control, Safety Monitor Inputs, and Ground Wiring

Table 1 provides the power, control, safety monitor inputs, ground wire capacity and the tightening torque requirements. The power, control, ground, and safety monitor terminals will accept a maximum of two wires per terminal.

Table 1 Power, Control, Safety Monitor Inputs, Ground Wire Size, and Torque Specifications

| Terminals | Wire Size | Torque | Wire Strip Length |
|-----------------------------------|---|--|-------------------|
| Power and Ground | Primary/Secondary Terminal: 1.0...4.0 mm ² (#18 ...#10 AWG) | Primary Terminal: 10.6...21.6 lb.-in. (1.2...2.4 N•m) Secondary Terminal: 5.3...7.3 lb.-in. (0.6...0.8 N•m) | 0.35 in. (9 mm) |
| Control and Safety Monitor Inputs | 0.34mm ² ...4.0 mm ² (#22...#10 AWG) | 5.0...5.6 lb.-in. (0.6 N•m) | 0.35 in. (9 mm) |

Terminal Designations for Conduit Entrance

As shown in Figure 9, the ArmorStart Distributed Motor Controller contains terminals for power, control, safety monitor inputs, and ground wiring. Access can be gained by removing the terminal access cover plate.

Figure 9 ArmorStart Power, Control, and Safety Monitor Terminals

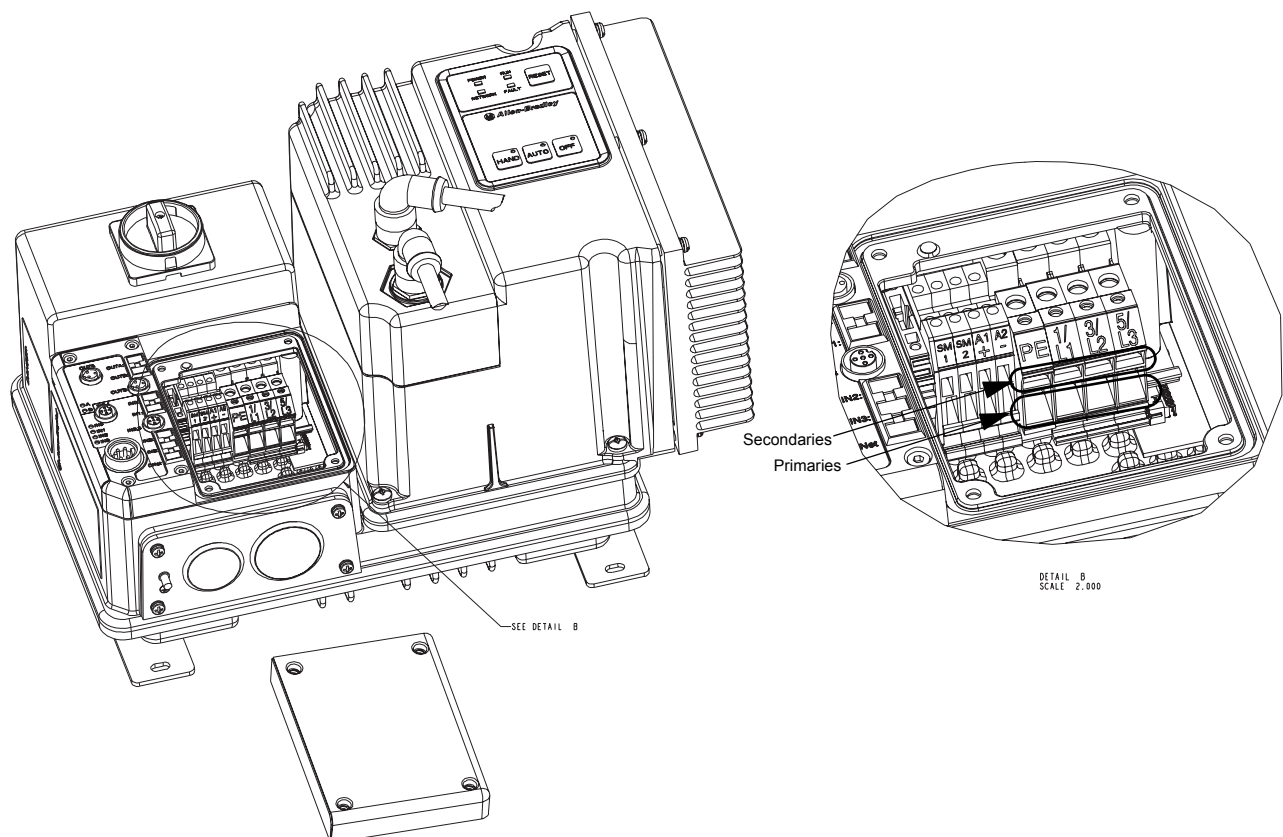


Table 2 Power, Control, Safety Monitor, and Ground Terminal Designations

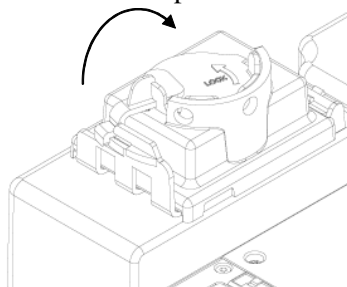
| Terminal Designations | No. of Poles | Description |
|-----------------------|--------------|----------------------|
| SM1 ❶ | 2 | Safety Monitor Input |
| SM2 ❶ | 2 | Safety Monitor Input |
| A1 (+) | 2 | Control Power Input |
| A2 (-) | 2 | Control Power Common |
| PE | 2 | Ground |
| 1/L1 | 2 | Line Power Phase A |
| 3/L3 | 2 | Line Power Phase B |
| 5/L5 | 2 | Line Power Phase C |

❶ Only available with the Safety Monitor option.

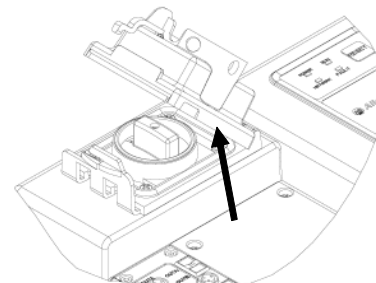
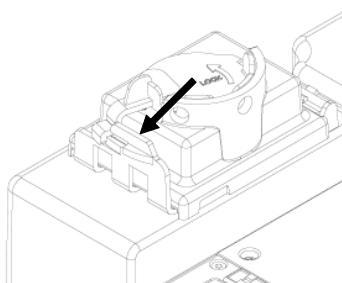
Operation of NEMA Type 4X Disconnect Handle

To Open Disconnect Handle

1. Rotate locking ring 45° until it stops.



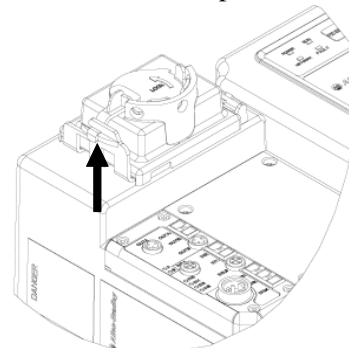
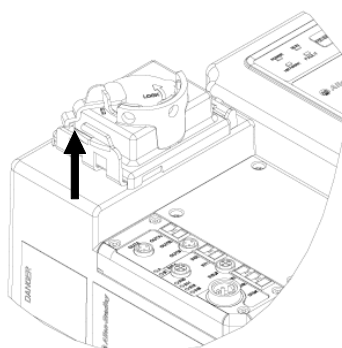
2. To open, push the tab on the left-hand side and lift the access cover.



Note: The access door can not be closed when 140 (black handle) is in the OFF position.

To Close Disconnect Handle for Lockout/Tag out

With disconnect handle in the ON position, rotate lockout/tag out ring counterclockwise until the disconnect handle is in the OFF position.



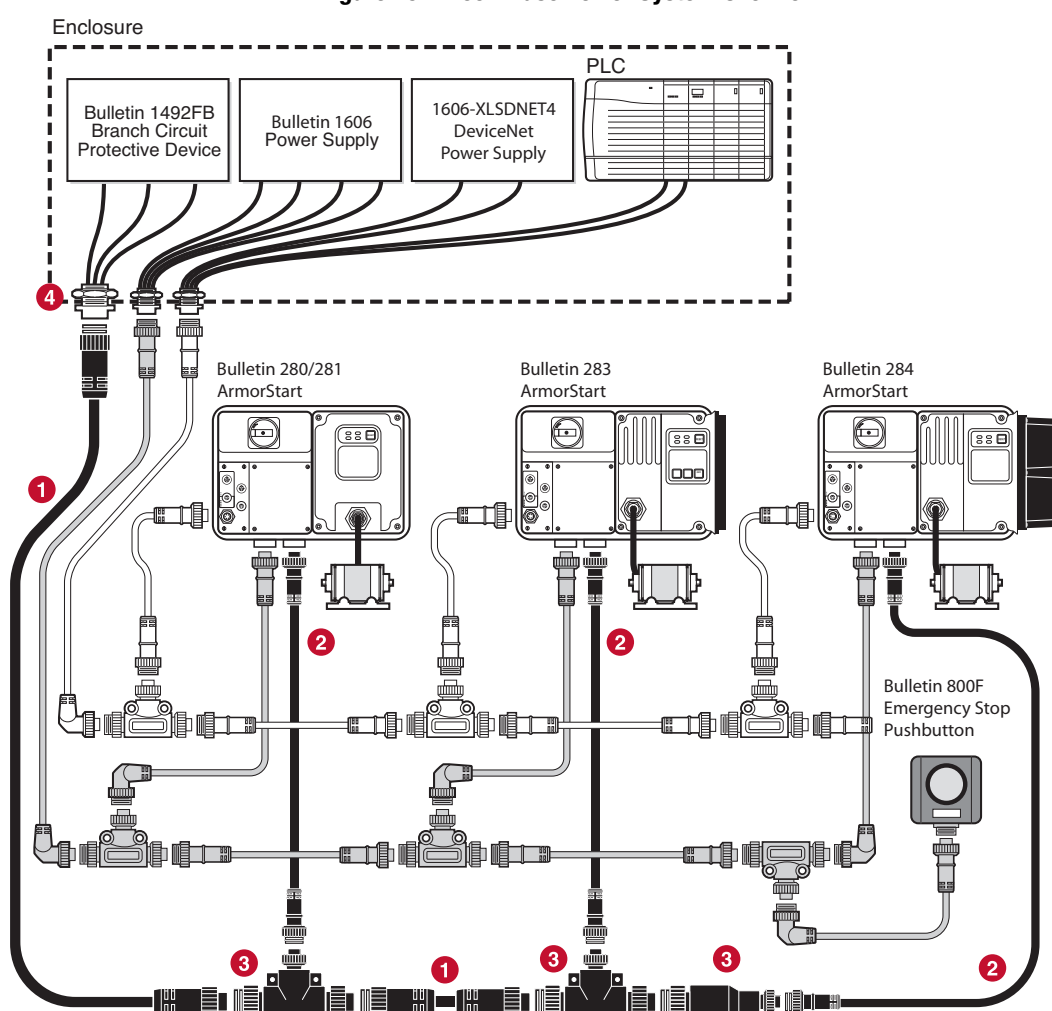
Note: The disconnect handle is designed to be used with a 1/4 in. lockout/tag out padlock.

ArmorConnect Power Media

Description

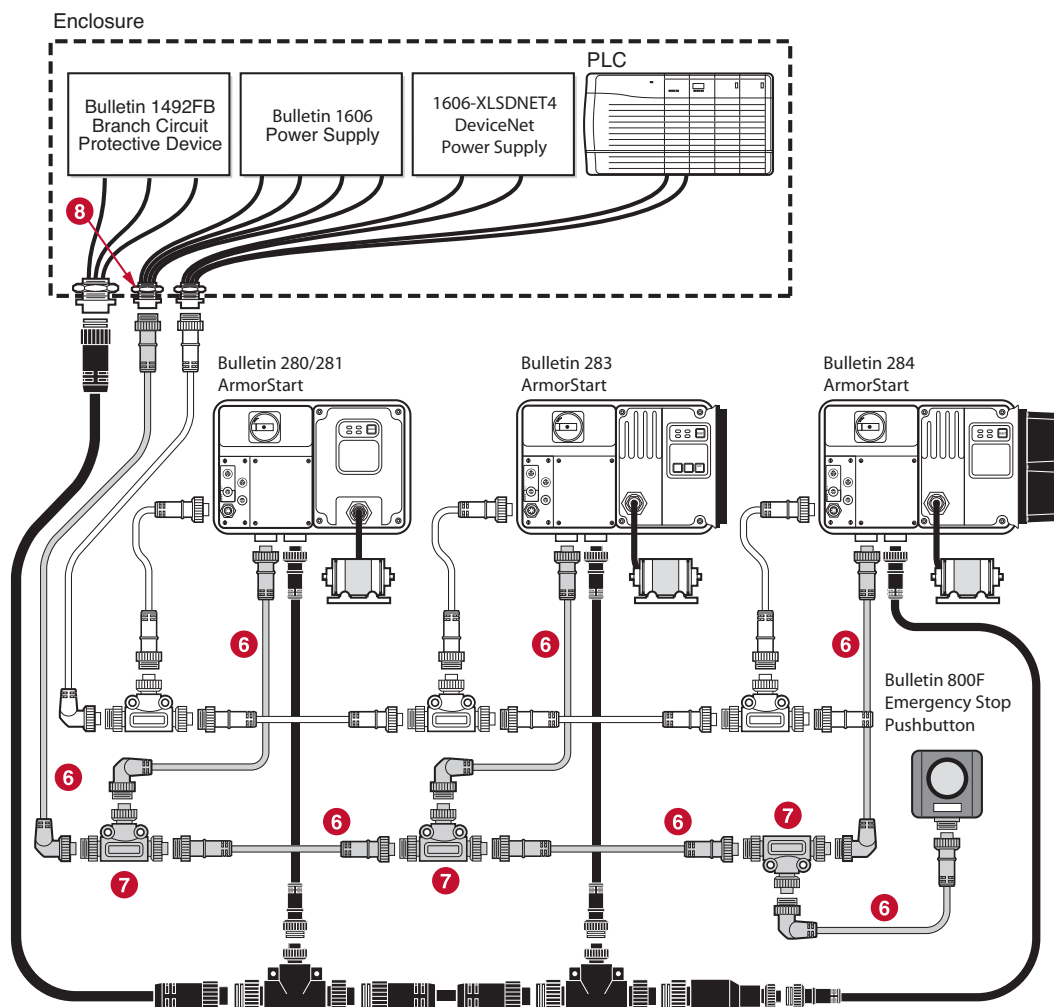
The ArmorStart Power Media offers both three-phase and control power cable system of cordsets, patchcords, receptacles, tees, reducers and accessories to be utilized with the ArmorStart Distributed Motor Controller. These cable system components allow quick connection of ArmorStart Distributed Motor Controllers and reduce installation time. They provide for repeatable, reliable connection of the three-phase and control power to the ArmorStart Distributed Motor Controller and motor by providing a plug and play environment that also avoids system mis-wiring. When specifying power media for use with the ArmorStart Distributed Motor Controllers (Bulletins 280, 281, 283, and 284) use only Bulletin 280 ArmorConnect™ power media.

Figure 10 Three-Phase Power System Overview



- ❶ Three-Phase Power Trunk- PatchCord cable with integral female or male connector on each end. (Example Part Number: 280-PWR35A-M*)
- ❷ Three-Phase Drop Cable- PatchCord cable with integral female or male connector on each end. (Example Part Number: 280-PWR22A-M*)
- ❸ Three-Phase Power Tees and Reducer -
 Tee connects to a single drop line to trunk with quick change connectors – Part Number: 280-T35
 Reducing Tee connects to a single drop line (Mini) to trunk (Quick change) connector – Part Number: 280-RT35
 Reducer connects from quick change male connector to mini female connector – Part Number: 280-RA35
- ❹ Three-Phase Power Receptacles -
 Female receptacles are a panel mount connector with flying leads – Part Number: 280-M35F-M1

Figure 11 Control Power Media System Overview



- ⑥ Control Power Media Patchcords - PatchCord cable with integral female or male connector on each end
Example Part Number: 889N-F65GFNM-*
- ⑦ Control Power Tees - The E-stop In Tee (Part Number: 898N-653ES-NKF) is used to connect to the Bulletin 800F On-Machine E-Stop station using a control power media patchcord. The E-stop Out tee (Part Number: 898N-653ST-NKF) is used with cordset or patchcord to connect to the ArmorStart Distributed Motor Controller.
- ⑧ Control Power Receptacles - Female receptacles are a panel mount connector with flying leads –
Part Number: 888N-D65AF1-*

ArmorStart with ArmorConnect Connectivity

ArmorStart devices with 10 A short circuit protection rating



Control Power Receptacle

Three-Phase Power Receptacle

ArmorStart devices with 25 A short circuit protection rating



Control Power Receptacle

Three-Phase Power Receptacle

Installing ArmorConnect Power Media using Cord Grids

Cord Grips for ArmorStart Devices with 10 A short circuit protection rating



Cord Grips for ArmorStart Devices with 25 A short circuit protection rating





| Terminal Designations | Description | Color Code |
|-----------------------|----------------------|--------------|
| A1 (+) | Control Power Input | Blue |
| A2 (-) | Control Power Common | Black |
| PE | Ground | Green/Yellow |
| 1/L1 | Line Power - Phase A | Black |
| 2/L2 | Line Power - Phase B | White |
| 3/L3 | Line Power - Phase C | Red |

ArmorConnect Cable Ratings

The ArmorConnect Power Media cables are rated per UL Type TC 600V 90 °C Dry 75 °C Wet, Exposed Run (ER) or MTW 600V 90 °C or STOOW 105 °C 600V - CSA STOOW 600V FT2. For additional information regarding ArmorConnect Power Media see the ArmorStart User Manual.

Branch Circuit Protection Requirements for ArmorConnect™ Three-Phase Power Media

When using ArmorConnect Three-Phase Power Media, only fuses can be used for the motor branch circuit protective device, for the group motor installations. The recommended fuse types are the following: Class CC, T, or J type fuses. For additional information, see the ArmorStart User Manual.

Group Motor Installations for USA and Canada Markets

The ArmorStart Distributed Motor controllers are listed for use with each other in group installations per NFPA 79, Electrical Standard for Industrial Machinery. When applied according to the group motor installation requirements, two or more motors, of any rating or controller type, are permitted on a single branch circuit. Group Motor Installation has been successfully used for many years in the USA and Canada.

Wiring and Workmanship Guidelines

In addition to conduit and seal-tite raceway, it is acceptable to utilize cable that is dual rated Tray Cable, Type TC-ER and Cord, STOOW, for power and control wiring on ArmorStart installations. In the USA and Canada installations, the following guidance is outlined by the NEC and NFPA 79.

In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, and where the exposed cable is continuously supported and protected against physical damage using mechanical protection, such as struts, angles, or channels, Type TC tray cable that complies with the crush and impact requirements of Type MC (Metal Clad) cable and is identified for such use with the marking Type TC-ER (Exposed Run)* shall be permitted between a cable tray and the utilization equipment or device as open wiring. The cable shall be secured at intervals not exceeding 1.8 m (6 ft) and installed in a “good workman-like” manner. Equipment grounding for the utilization equipment shall be provided by an equipment grounding conductor within the cable.

*Historically cable meeting these crush and impact requirements were designated and marked “Open Wiring”. Cable so marked is equivalent to the present Type TC-ER and can be used.

While the ArmorStart is intended for installation in factory floor environments of industrial establishments, the following must be taken into consideration when locating the ArmorStart in the application: Cables, including those for control voltage including 24V DC and communications, are not to be exposed to an operator or building traffic on a continuous basis. Location of the ArmorStart to minimize exposure to continual traffic is recommended. If location to minimize traffic flow is unavoidable, other barriers to minimize inadvertent exposure to the cabling should be considered. Routing cables should be done in such a manner to minimize inadvertent exposure and/or damage.

Additionally, if conduit or other raceways are not used, it is recommended that strain relief fittings be utilized when installing the cables for the control and power wiring through the conduit openings.

The working space around the ArmorStart may be minimized as the ArmorStart does not require examination, adjustment, servicing or maintenance while energized. In lieu of this service, the ArmorStart is meant to be unplugged and replaced after proper lockout/tag-out procedures have been employed.

Since the ArmorStart is available with a factory installed HOA keypad option this may require the ArmorStart to be selected and installed as follows if the application requires frequent use of the hand operated interface by the equipment operator:

1. They are not less than 0.6 m (2 ft) above the servicing level and are within easy reach of the normal working position of the operator.
2. The operator is not placed in a hazardous situation when operating them.
3. The possibility of inadvertent operation is minimized.

If the operated interface is used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons operate and service the ArmorStart's operator interface, and the installation is located so that inadvertent operation is minimized then other installation locations with acceptable access can be provided.

DeviceNet Network Installation

The ArmorStart Distributed Motor Controller contains the equivalent of 30 in. (0.76 m) of Device Net drop cable's electrical characteristics and therefore 30 in. of drop cable must be included in the DeviceNet drop cable budget for each ArmorStart in addition to actual drop cable required for the installation.

Other DeviceNet System Design Considerations

The separation of the control power and DeviceNet power is recommended as a good design practice. This minimizes the load on the DeviceNet supply, and prevents transients which may be present on the control power system from influencing the communication controls.

AC Supply Considerations

Ungrounded Distribution Systems

ATTENTION

The Bulletin 284 contains protective MOVs that are referenced to ground. These devices should be disconnected if the Bulletin 284 is installed on an ungrounded distribution system.

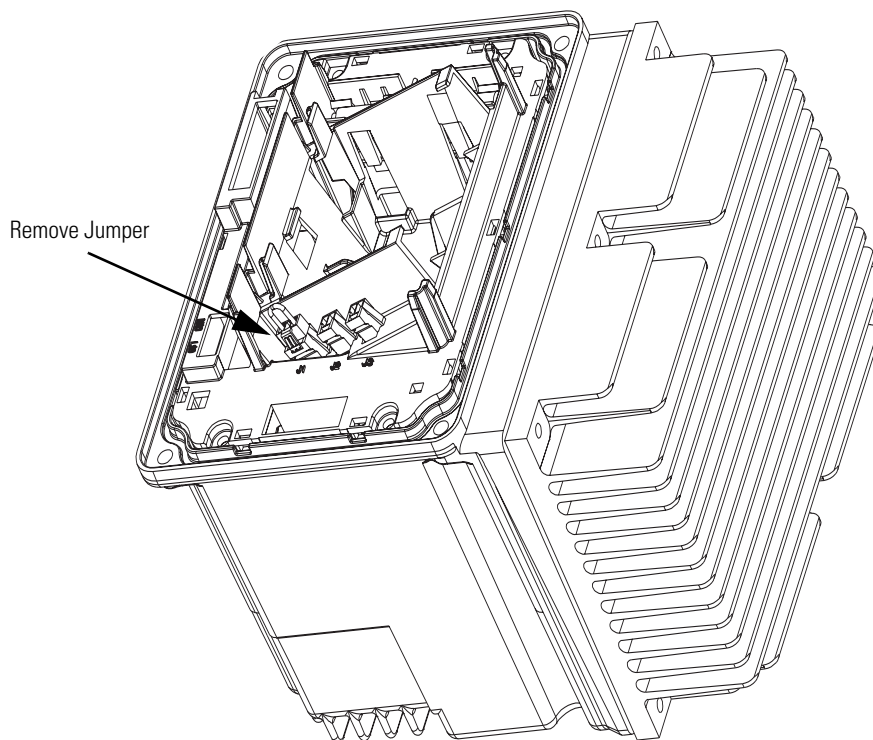
Disconnecting MOVs

To prevent drive damage, the MOVs connected to ground shall be disconnected if the drive is installed on an ungrounded distribution system where the line-to-ground voltages on any phase could exceed 125% of the nominal line-to-line voltage. To disconnect these devices, remove the jumper shown in Figure 13, *Jumper Removal*.

1. Before installing the Bulletin 284, loosen four mounting screws.
2. Unplug control module from the base unit by pulling forward.

Figure 12 Removal of Control Module



Figure 13 Jumper Removal**ATTENTION**

Do not remove this jumper if the unit is equipped with an EMI filter installed.

**LED Status Indication**

The LED Status Indication provides 4 status LEDs and a Reset button. The LEDs provide status indication for the following:

- **POWER LED**
The LED is illuminated solid green when control power is present and with the proper polarity
- **RUN LED**
This LED is illuminated solid green when a start command and control power are present
- **NETWORK LED**
This bi-color (red/green) LED indicates the status of the communication link
- **FAULT LED**
Indicates Controller Fault (trip) condition

The “Reset Button” as a local trip reset.

Figure 14 LED Status Indication and Reset



DeviceNet Node Commissioning

ATTENTION



Three-phase power must be applied to the Bulletin 284 Distributed Motor Controller to gain access to drive parameters.

Establishing a DeviceNet Node Address

The ArmorStart is shipped with a default node address of 63 and Autobaud enabled. Each device on a DeviceNet network must have a unique node address or MAC ID which can be set to a value from 0...63. Keep in mind that most DeviceNet systems use address 0 for the master device (Scanner) and node address 63 should be left vacant for introduction of new slave devices. The ArmorStart offers two methods for node commissioning as shown in the following pages.

Node Commissioning using Software

To set the node address of the ArmorStart using software or other handheld tools, leave the hardware rotary switches in their default position (99) or insure that they are set to something greater then (63). With the hardware switches set, use the software or handheld tool to change the address.

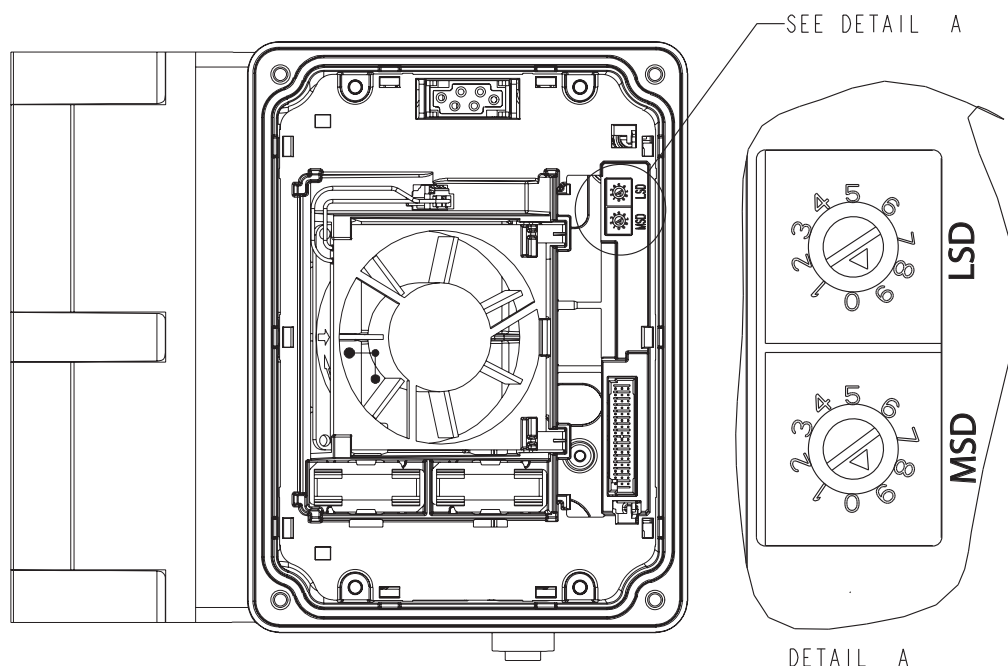
When using software to node commission a device, it may be necessary to have the EDS file stored on the computer. The EDS file defines how the software such as RSNetWorx for DeviceNet will communicate to the ArmorStart. Rockwell Automation product EDS files are available on the internet at: <http://www.ab.com/networks/eds>. **You must use RSNetWorx for DeviceNet Revision 3.21 Service Pack 2 or later.**

Node Commissioning using Hardware

The ArmorStart is shipped with the hardware rotary switches set to a value of (99). If the switches are set to a value of (64) or above, the device will automatically configure itself to the software node address. If the switches are set to a value of (63) or less, the device will be at the node address designated by the switch configuration.

To set an address using the hardware rotary switches, simply set the switches to the desired node address. To access the node address rotary switches, three-phase and control power should be turned off. Then remove the starter module from the base unit. The rotary node address switches are located on the back side of the starter module. Change the switches to the desired node address. Re-install the starter module to the base unit. Reapply power and the device will re-start at the new address.

Figure 15 Rotary Node Address Configuration



System Configuration Information

The following information is provided to identify the default method for setting up communication to the ArmorStart. Additional configuration information and advanced settings help can be found in the ArmorStart User Manual, Publication 284-UM001*-EN-P.

Using Automap Feature with Default Input and Output (I/O) Assemblies

The Automap feature available in all Rockwell Automation scanners will automatically map the information as shown below. If manual mapping is required, the information below can be used to map a device based on the default configuration.

Table 3 Default I/O Messaging Data

| | Default |
|--------------------|--------------|
| Message type | Polled |
| Consumed data size | 4 byte (Rx) |
| Produced data size | 4 bytes (Tx) |

Default Input and Output (I/O) Assembly Formats

The I/O assembly formats for the ArmorStart are identified by the value in Parameter 11 (Consumed IO Assy.) and Parameter 12 (Produced IO Assy.). These values determine the amount and arrangement of the information communicated to the master scanner. The tables below identify the default information produced and consumed by Bulletin 284 devices. For additional formats and advance configurations please reference the user manual:

Defaults for Bulletin 284 Distributed Motor Controllers

Table 4 Instance 164 — Default Consumed Inverter Type Distributed Starter (4 bytes)

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|--|------------|------------|------------|---------------------|---------------------|---------------------|---------------------|
| 0 | User Out B | User Out A | — | Jog Rev | Jog Fwd | Fault Reset | Run Rev | Run Fwd |
| 1 | Drive In 4 | Drive In 3 | Drive In 2 | Drive In 1 | Decel Rate 2 Enable | Decel Rate 1 Enable | Accel Rate 2 Enable | Accel Rate 1 Enable |
| 2 | Comm Frequency Command (Low) (xxx.x Hz) | | | | | | | |
| 3 | Comm Frequency Command (High) (xxx.x Hz) | | | | | | | |

Table 5 Instance 165 — Default Produced Inverter Type Distributed Starter (4 bytes)

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|------------------------------------|------------------------|----------------|------------|-------------|-------------|---------|---------|
| 0 | At Reference | Net Ref Status | Net Ctl Status | Ready | Running Rev | Running Fwd | Alarm | Tripped |
| 1 | Contact ^❶ 2 | Contact ^❷ 1 | 140M On | HOA Status | Input 3 | Input 2 | Input 1 | Input 0 |
| 2 | Output Frequency (Low) (xxx.x Hz) | | | | | | | |
| 3 | Output Frequency (High) (xxx.x Hz) | | | | | | | |

❶ Refers to output contactor status.

❷ Refers to source brake contactor status.

Setting the Motor OL Current

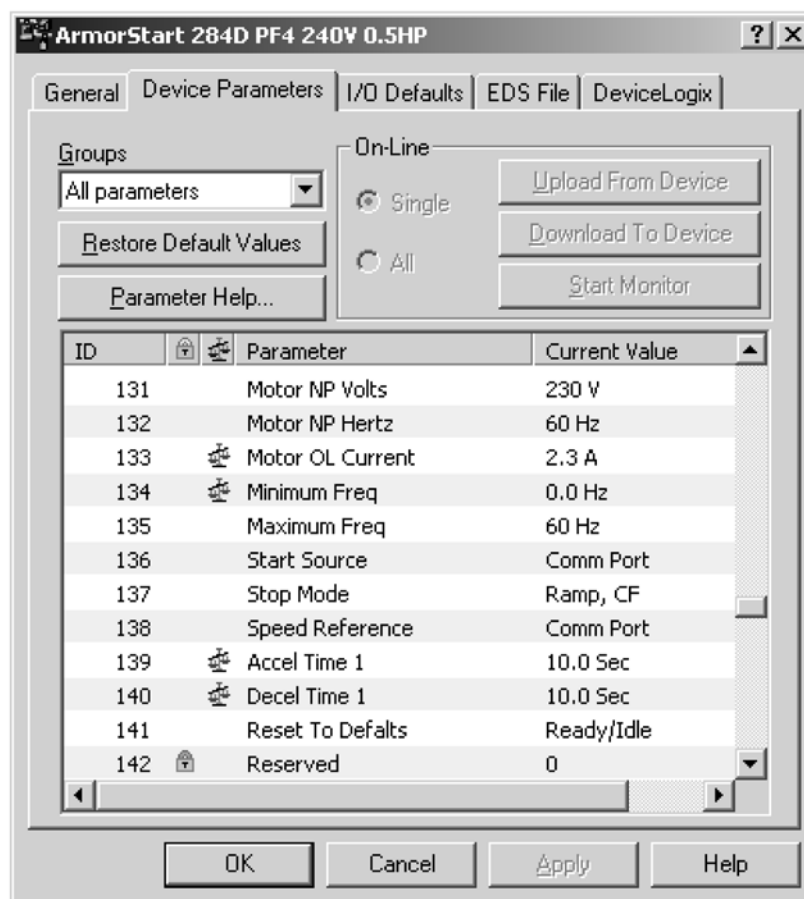
The product should now be configured and communicating on the network. The last step is to program the proper motor OL current setting (Parameter 133). This can be accomplished by using software such as RSNetWorx for DeviceNet or a handheld DeviceNet tool.

Use the software to access the device parameters screen. By default the motor OL current is set to the minimum motor OL current setting for the device. Set this parameter to the desired value and download to the device.

Select **Motor OL Current** (Parameter 133) and enter a value that corresponds to the FLA of the motor connected to the ArmorStart. Make sure the **Single** radio button is selected and then select **Download to Device**.

The proper motor protection is now in place.

Figure 16 RSNetWorx Parameter Screen



Bulletin 284 Parameters

Table 6 Basic Program Group for Sensorless Vector Performance

| Parameter Number | Parameter Description | Display/Options | Min./Max. | Defaults Settings |
|------------------|-----------------------|---|----------------------------|-------------------------|
| 131 ❶ | Motor NP Volts | 1 VAC | 20/Drive Rated Volts | Based on Driving Rating |
| 132 ❶ | Motor NP Hz | 1 Hz | 10/240 Hz | 60 Hz |
| 133 | Motor OL Current | 0.1 A | 0.0/(Drive Rated Amps x 2) | Based on Driving Rating |
| 134 | Minimum Freq. | 0.1 Hz | 0.0/240 Hz | 0.0 Hz |
| 135 ❶ | Maximum Freq. | 0.1 Hz | 0.0/240 Hz | 60 Hz |
| 136 ❶ | Start Source | 0 = Keypad ❷ 1 = 3-Wire ❷ 2 = 2-Wire 3 = 2-W Lvl Sens 4 = 2-W Hi Speed 5 = Comm Port | 0/5 | 5 |
| 137 | Stop Mode | 0 = Ramp, CF 1 = Coast, CF 2 = DC Brake, CF 3 = DCBrkAuto, CF 4 = Ramp 5 = Coast 6 = DC Brake 7 = DC BrakeAuto | 0/7 | 0 |
| 138 | Speed Reference | 0 = Drive Pot ❷ 1 = InternalFreq 2 = 0...10V Input ❷ 3 = 4...20 mA Input ❷ 4 = Preset Freq 5 = Comm Port | 0/5 | 5 |
| 139 | Accel Time 1 | 0.1 Secs | 0.0/600.0 Secs | 10.0 Secs |
| 140 | Decel Time 1 | 0.1 Secs | 0.0/600.0 Secs | 10.0 Secs |
| 141 ❶ | Reset to Default | 0 = Ready/Idle 1 = FactoryRset | 0/1 | 0 |

❶ Stop drive before changing this parameter.

❷ See Important below:

IMPORTANT

These drive parameters options will cause the Bulletin 284 ArmorStart Distributed Motor Controller to become disabled.

Table 7 Basic Program Group for Sensorless Vector Control

| Parameter Number | Parameter Description | Display/Options | Min./Max. | Defaults Settings |
|------------------|-----------------------|---|----------------------------|-------------------------|
| 131 ❶ | Motor NP Volts | 1 VAC | 20/Drive Rated Volts | Based on Driving Rating |
| 132 ❶ | Motor NP Hz | 1 Hz | 15/400 Hz | 60 Hz |
| 133 | Motor OL Current | 0.1 A | 0.0/(Drive Rated Amps x 2) | Based on Driving Rating |
| 134 | Minimum Freq. | 0.1 Hz | 0.0/400 Hz | 0.0 Hz |
| 135 ❶ | Maximum Freq. | 0.1 Hz | 0.0/400 Hz | 60 Hz |
| 136 ❶ | Start Source | 0 = Keypad ❷ 1 = 3-Wire ❷ 2 = 2-Wire 3 = 2-W Lvl Sens 4 = 2-W Hi Speed 5 = Comm Port | 0/5 | 5 |
| 137 | Stop Mode | 0 = Ramp, CF 1 = Coast, CF 2 = DC Brake, CF 3 = DCBrkAuto, CF 4 = Ramp 5 = Coast 6 = DC Brake 7 = DC BrakeAuto 8 = Ramp + EM B, CF 9 = Ramp + EM Brk | 0/9 | 9 |
| 138 | Speed Reference | 0 = Drive Pot ❷ 1 = InternalFreq 2 = 0...10V Input ❷ ❸ 3 = 4...20 mA Input ❷ 4 = Preset Freq 5 = Comm Port 6 = Stp Logic 7 = Anlg in Mult ❷ | 0/7 | 5 |
| 139 | Accel Time 1 | 0.1 Secs | 0.0/600.0 Secs | 10.0 Secs |
| 140 | Decel Time 1 | 0.1 Secs | 0.0/600.0 Secs | 10.0 Secs |
| 141 ❶ | Reset to Default | 0 = Ready/Idle 1 = FactoryRset | 0/1 | 0 |

❶ Stop drive before changing this parameter.

❷ See Important below:

❸ Available with the A10 factory installed option.

IMPORTANT

These drive parameters options will cause the Bulletin 284 ArmorStart Distributed Motor Controller to become disabled.

Quick Reference Troubleshooting

There are four LEDs on the front of the ArmorStart that can provide an indication as to the health of the device. The following is a brief explanation of the operation of each LED.

Table 8 LED Status Indication

| LED | Definition |
|---------|---|
| Power | This LED will be illuminated solid green when control power is present and with the proper polarity. |
| Run | This LED will be illuminated solid green when a start command and control power are present. |
| Network | This bi-color LED is used to indicate the status of the DeviceNet network. See the Network Status LED table below for additional information. |
| Fault | This LED is used to indicate the fault status of the ArmorStart. When the unit is faulted, the unit will respond with a specific blink pattern to identify the fault. See the Fault LED table below for additional information. |

Table 9 Network LED Status Indication

| Network Status LED | Definition | Possible Causes |
|------------------------|---|---|
| Off | The device has not completed the initialization, is not on an active network, or may not be powered up. | Check to make sure the product is properly wired and configured on the network. |
| Flashes green-red-off | While waiting to detect the network baud rate, the LED will flash this pattern about every 3 seconds. | If the product stays in this state it means that there is no set baud rate. Insure that at least one device on the network has a set baud rate. |
| Solid Green | The device is operating in a normal condition, and is communicating to another device on the network. | No action required. |
| Flashing Green | The device is operating in a normal condition, is on-line, but with no connection to another device. This is the typical state for new devices. | The device may need to be mapped to a master scanner, placed in a scanlist, or have another device communicate to it. |
| Flashing Red | Recoverable fault has occurred. | Check to make sure the PLC™ and scanner are operating correctly and that there are no media/cabling issues. Check to see if other networked devices are in a similar state. |
| Solid Red | The device has detected a major error that has rendered it incapable of communicating on the network (Duplicate MAC ID, Bus-off, media issue). | Troubleshooting should be done to ensure that the network is correct (terminators, lengths, etc.) and there is not a duplicate node problem. If other devices on the network appear to be operating fine and power cycling the device does not work, contact Technical Support. |
| Flashing Red and Green | The device is in a communication faulted state. | Power cycling the device may resolve the problem; however, if the problem continues, it may be necessary to contact Technical Support. |

Fault Definitions

Some of the Bulletin 284 ArmorStart Distributed Motor Controller faults are detected by the internal hardware of the ArmorStart, while others are detected by the internal drive. For internal drive faults, the internal hardware of the ArmorStart simply polls the drive for the existence of faults and reports the fault state. No fault latching is done by the internal hardware of the ArmorStart for these faults. The Pr FltReset Mode parameter (Parameter 23) determines the Auto Resetability of only the faults that are detected on the main control board. These faults are listed as “param 23” autoresettable in Table 10. The Auto Resetability of the faults that are detected in the internal drive is controlled by internal drive parameters. These faults are listed as drive controlled in Table 10.

Fault LED Indications for Bulletin 284D ArmorStart Distributed Motor Controllers

Table 10 Controller Fault LED Definitions

| Blink Pattern | Fault Definitions | | Possible Causes or Remedies |
|---------------|-------------------|--|---|
| | AarmorStart | Drive Controlled | |
| 1 | Short (140M) | — | The circuit breaker has tripped. Try to reset the breaker. If the condition continues check the power wiring. This fault cannot be disabled. |
| 2 | — | Overload Fault (Drive Error Codes 7 and 64) | An excessive motor load exists. Reduce load so drive output current does not exceed the current set by Parameter 133 (Motor OL Current) and verify Parameter 184 (Boost Select) setting. Reduce load or extend Accel Time. This fault cannot be disabled. |
| 3 | — | Phase Short (Drive Error Codes 41...43) | The ArmorStart has detected a phase short. Excessive current has been detected between two of the output terminals. Check the motor for a shorted condition. Replace starter module if fault cannot be cleared. This fault cannot be disabled. |
| 4 | — | Ground Fault (Drive Error Codes 13, 38...40) | A current path to earth has been detected at or more of the drive output terminals or a phase to ground fault has been detected between the drive and motor in this phase. Check the motor for a grounded condition. Replace starter module if fault cannot be cleared. This fault cannot be disabled. |
| 5 | — | Motor Stalled (Drive Error Code 6) | Drive is unable to accelerate motor. Increase Parameter 139 and/or 167 (Accel Time x) or reduce load so drive output current does not exceed the current by Parameter 189. This fault cannot be disabled. |
| 6 | Control Power | — | The ArmorStart has detected a loss of the control power voltage. Check control voltage, wiring, and proper polarity. Also check and replace control voltage fuse, if necessary. This fault can be disabled and <i>is</i> disabled by default. |
| 7 | I/O Fault | — | Depending on the types of modules in the configuration this error could be generated by a shorted sensor, shorted input device, wiring mistakes, or a blown output fuse. If this fault occurs, the offending problem should be isolated or removed prior to restarting the system. This fault can be disabled and <i>is</i> disabled by default. |
| 8 | — | Heatsink Overtemperature (Drive Error Code 8) | Heatsink temperature exceeds a predefined value. Verify that ambient temperature has not exceeded. This fault cannot be disabled. Replace internal fan. |
| 9 | — | Over-Current (Drive Error Codes 12 and 63) | The ArmorStart has detected a voltage imbalance. Check the power system and correct if necessary. This fault cannot be disabled. |
| 10 | DNet Power Loss | — | DeviceNet power has been lost or has dropped below the 12V threshold. Check the state of the network power supply and look for DeviceNet media problems. This fault can be disabled and <i>is</i> disabled by default. |
| 11 | Internal Comm | — | This fault occurs when communications between the main board the drive is lost. This fault cannot be disabled. |
| 12 | — | DC Bus Fault (Drive Error Codes 3, 4, and 5) | DC bus voltage remained below 85% of nominal. DC bus voltage fell below the minimum value. DC bus voltage exceeded maximum value. Monitor the incoming AC line for low voltage or line power interruption. Check input fuses. Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install a starter module with the dynamic brake option. This fault cannot be disabled. |
| 13 | — | EEPROM Fault/Internal Comm Flt (Drive Error Codes 81 and 100) | This is a major fault, which renders the ArmorStart inoperable. Possible causes of this fault are transients induced during EEprom storage routines. If the fault was initiated by a transient, power cycling should clear the problem. Otherwise replacement of the starter module may be required. This fault cannot be disabled. |
| 14 | — | Hardware Fault (Drive Error Codes 2, 70, and 122) | This fault indicates that a serious hardware problem exists. Check for a base/starter module mismatch. Auxiliary input interlock is open. Failure has been detected in the drive power section. Failure has been detected in the Drive control and I/O section. Cycle power and replace drive if fault cannot be cleared. This fault cannot be disabled. |
| 15 | — | Auto Restart Tries (Drive Error Code 33) | Drive unsuccessfully attempted to reset a fault and resume running for the programmed number of Parameter 192 (Auto RstrTries). Correct the cause of the fault. This fault cannot be disabled. |
| 16 | — | Miscellaneous Fault | This fault is actually the logical OR of the drive's Auxiliary Input fault (Fault Code 2), Heatsink Overtemperature fault (Fault Code 8), Parameter Defaulted fault (Fault Code 48), and SVC Autotune fault (Fault Code 80). This fault cannot be disabled. |

Internal Drive Faults

A fault is a condition that stops the drive. There are two fault types.

Table 11 Internal Drive Fault Types

| Type | Description |
|------|--|
| 1 | Auto-Reset/Run When this type of fault occurs, and Parameter 192 (Auto Rstrt Tries) Related Parameter(s): 155, 158, 161, 193 is set to a value greater than 0, a user-configurable timer, Parameter 193 (AutoRstrt Delay) Related Parameter(s): 192, begins. When the timer reaches zero, the drive attempts to automatically reset the fault. If the condition that caused the fault is no longer present, the fault will be reset and the drive will be restarted. |
| 2 | Non-Resettable This type of fault may require drive or motor repair, or is caused by wiring or programming errors. The cause of the fault must be corrected before the fault can be cleared. |

Automatically Clearing Faults (Option/Step)

Clear a Type 1 fault and restart the drive.

1. Set Parameter 192 (Auto Rstrt Tries) to a value other than 0.
2. Set Parameter 193 (Auto Rstrt Delay) to a value other than 0.

Clear an OverVoltage, UnderVoltage or Heatsink OvrTmp fault without restarting the drive.

1. Set 192 [Auto Rstrt Tries] to a value other than 0.
2. Set 193 [Auto Rstrt Delay] to 0.

Auto Restart (Reset/Run)

The Auto Restart feature provides the ability of the drive to automatically perform a fault reset followed by a start attempt without user or application intervention. This allows remote or unattended operation. Only certain faults are allowed to be reset. Certain faults (Type 2) that indicate possible drive component malfunction are not resettable.

Caution should be used when enabling this feature, since the drive will attempt to issue its own start command based on user selected programming.

Table 12 Fault Types, Descriptions, and Actions

| No. | Fault | Type ❶ | Description | Action |
|-------------------|--|-----------|---|---|
| F2 | Auxiliary Input | 1 | Auxiliary input interlock is open. | 1. Check remote wiring. 2. Verify communications. |
| F3 | Power Loss | 2 | DC bus voltage remained below 85% of nominal. | 1. Monitor the incoming AC line for low voltage or line power interruption. 2. Check input fuses. |
| F4 | UnderVoltage | 1 | DC bus voltage fell below the minimum value. | Monitor the incoming AC line for low voltage or line power interruption. |
| F5 | OverVoltage | 1 | DC bus voltage exceeded maximum value. | Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install dynamic brake option. |
| F6 | Motor Stalled | 1 | Drive is unable to accelerate motor. | Increase Parameter 139...167 (Accel Time x) or reduce load so drive output current does not exceed the current set by Parameter 189 (Current Limit 1). |
| F7 | Motor Overload | 1 | Internal electronic overload trip | 1. An excessive motor load exists. Reduce load so drive output current does not exceed the current set by Parameter 133 (Motor OL Current). 2. Verify Parameter 184 (Boost Select) setting |
| F8 | Heatsink OvrTmp | 1 | Heatsink temperature exceeds a predefined value. | 1. Check for blocked or dirty heat sink fins. Verify that ambient temperature has not exceeded 40°C. 2. Replace internal fan. |
| F12 | HW OverCurrent | 2 | The drive output current has exceeded the hardware current limit. | Check programming. Check for excess load, improper programming of Parameter 184 (Boost Select), DC brake volts set too high, or other causes of excess current. |
| F13 | Ground Fault | 2 | A current path to earth ground has been detected at one or more of the drive output terminals. | Check the motor and external wiring to the drive output terminals for a grounded condition. |
| F33 | Auto Rstrt Tries | | Drive unsuccessfully attempted to reset a fault and resume running for the programmed number of Parameter 192 (Auto Rstrt Tries). | Correct the cause of the fault and manually clear. |
| F38 F39 F40 | Phase U to Gnd Phase V to Gnd Phase W to Gnd | 2 | A phase to ground fault has been detected between the drive and motor in this phase. | 1. Check the wiring between the drive and motor. 2. Check motor for grounded phase. 3. Replace starter module if fault cannot be cleared. |
| F41 F42 F43 | Phase UV Short Phase UW Short Phase VW Short | 2 | Excessive current has been detected between these two output terminals. | 1. Check the motor and drive output terminal wiring for a shorted condition. 2. Replace starter module if fault cannot be cleared. |

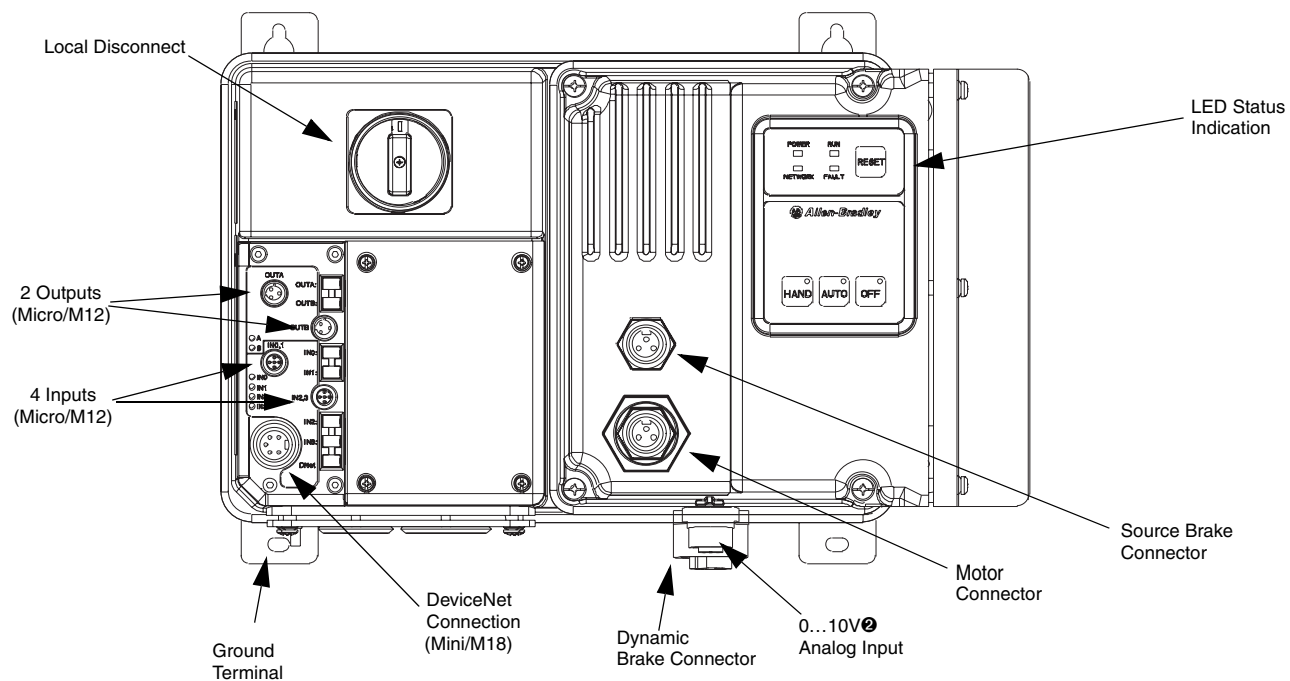
❶ See Table 11 for internal drive fault types.

Table 12 Fault Types, Descriptions, and Actions (Continued)

| No. | Fault | Type ❶ | Description | Action |
|------|--------------------|-----------|--|--|
| F48 | Params Defaulted | 2 | The drive was commanded to write default values to EEPROM. | 1. Clear the fault or cycle power to the drive. 2. Program the drive parameters as needed. |
| F63 | SW OverCurrent | 2 | Programmed Parameter 198 [SW Current Trip] has been exceeded. | Check load requirements and Parameter 198 (SW Current Trip) setting. |
| F64 | Drive Overload | 2 | Drive rating of 150% for 1 min. or 200% for 3 sec. has been exceeded. | Reduce load or extend Accel Time. |
| F70 | Power Unit | 2 | Failure has been detected in the drive power section. | 1. Cycle power. 2. Replace starter module if fault cannot be cleared. |
| F80 | SVC Autotune | | The autotune function was either cancelled by the user or failed. | Restart procedure. |
| F81 | Comm Loss | 2 | RS485 (DSI) port stopped communicating. | 1. Turn off using Parameter 205 (Comm Loss Action). 2. Replace starter module if fault cannot be cleared. |
| F100 | Parameter Checksum | 2 | The checksum read from the board does not match the checksum calculated. | Set Parameter 141 (Reset To Defaults) to option 1 Reset Defaults . |
| F122 | I/O Board Fail | 2 | Failure has been detected in the drive control and I/O section. | 1. Cycle power. 2. Replace starter module if fault cannot be cleared. |

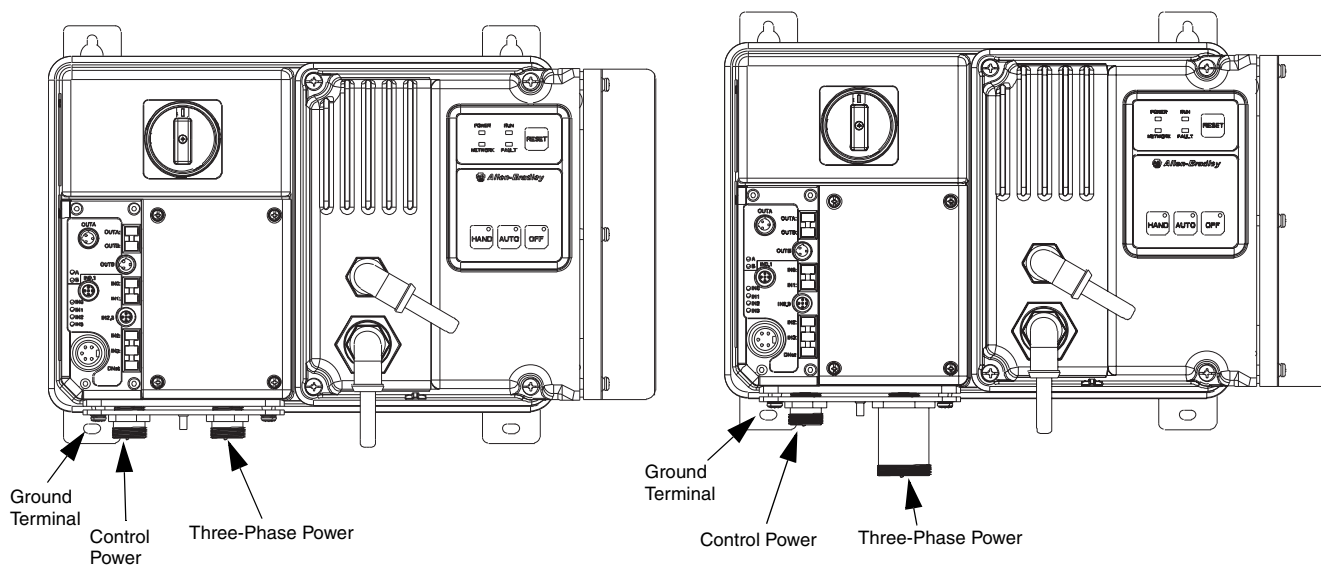
❶ See Table 11 for internal drive fault types.

Figure 17 Bulletin 284 ArmorStart







^② Available only with the Bulletin 284 with sensorless vector control.

Figure 18 Bulletin 284 ArmorStart with ArmorConnect



Accessories

Table 13 DeviceNet Media ^❶

| Description | | Length m (ft) | Cat. No. |
|---|---|---|--------------------------------------|
|  | KwikLink pigtail drops are Insulation Displacement Connector (IDC) with integral Class 1 round cables for interfacing devices or power supplies to flat cable | | Sealed |
| | | 1 m (3.3) | 1485P-P1E4-B1-N5 |
| | | 2 m (6.5) | 1485P-P1E4-B2-N5 |
| | | 3 m (9.8) | 1485P-P1E4-B3-N5 |
| | | 6 m (19.8) | 1485P-P1E4-B6-N5 |
|  | DeviceNet Mini- T-Port Tap | Right Keyway Left Keyway | 1485P-P1N5-MN5NF 1485P-P1N5-MN5KM |
|  | Gray PVC Thin Cable | Connector | Cat. No. |
| | | Mini Straight Female Mini Straight Male | 1485G-P ^❷ N5-M5 |
| | | Mini Straight Female Mini Right Angle Male | 1485G-P ^❷ W5-N5 |
| | | Mini Right Angle Female Mini Straight Male | 1485G-P ^❷ M5-Z5 |
| | | Mini Right Angle Female Mini Straight Male | 1485G-P ^❷ W5-Z5 |
|  | Thick Cable | Mini Straight Female Mini Straight Male | 1485C-P ^❸ N5-M5 |
| | | Mini Straight Female Mini Right Angle Male | 1485C-P ^❸ W5-N5 |
| | | Mini Right Angle Female Mini Straight Male | 1485C-P ^❸ M5-Z5 |
| | | Mini Right Angle Female Mini Straight Male | 1485C-P ^❸ W5-Z5 |




❶ See Publication M116-CA001A-EN-P for complete cable selection information.

❷ Replace symbol with desired length in meters (Example: 1485G-P1N5-M5 for a 1 m cable). Standard cable lengths: 1 m, 2 m, 3 m, 4 m, 5 m, and 6 m.

❸ Replace symbol with desired length in meters (Example: 1485C-P1N5-M5 for a 1 m cable). Standard cable lengths: 1 m, 2 m, 3 m, 4 m, 5 m, 6 m, 8 m, 10 m, 12 m, 18 m, 24 m, and 30 m.

NOTE: Stainless steel versions may be ordered by adding an "S" to the cat. no. (Example: 1485CS-P1N5-M5)

Table 14 Sensor Media ^①

| Description | ArmorStart I/O Connection | Pin Count | Connector | Cat. No. |
|---|---------------------------|-----------|-------------------------------------|----------------------------|
|  DC Micro Patchcord | Input | 5-Pin | Straight Female Straight Male | 889D-F4ACDM- ^② |
| | | | Straight Female Right Angle Male | 889D-F4AACDE- ^② |
|  DC Micro V-Cable | Input | 5-pin | Straight Female | 879D-F4ACDM- ^② |
| | | | Right Angle Male | 879D-R4ACM- ^② |
| DC Micro Y-Cable | Input | 5-pin | Straight Female Right Angle Male | 879D-F4ACTE- ^② |
|  AC Micro Patchcord | Output | 3-pin | Straight Female Straight Male | 889R-F3AERM- ^② |
| | | | Straight Female Right Angle Male | 899R-F3AERE- ^② |

① See Publication M116-CA001A-EN-P for complete cable selection information.

② Replace symbol with desired length in meters (Example: 889D-F4ACDM-1 for a 1 m cable). Standard cable lengths: 1 m, 2 m, 5 m, and 10 m.

NOTE: Stainless steel versions may be ordered by adding an “S” to the cat. no. (Example: 889DS-F4ACDM-1)

Table 15 Sealing Caps ^③

| Description | Used on I/O Connection | Cat. No. |
|---------------------------|------------------------|------------|
| Plastic Sealing Cap (M12) | Input | 1485A-M12 |
| Aluminum Sealing Cap | Output | 889A-RMCAP |

③ To achieve IP67 rating, sealing caps must be installed on all unused I/O connections.

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